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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/684,519	10/10/2000	Jin-Yuan Lee	MEG2000-001	3369
28112	7590	10/02/2003	EXAMINER BUI, HUNG S	
GEORGE O. SAILE & ASSOCIATES 28 DAVIS AVENUE POUGHKEEPSIE, NY 12603			ART UNIT 2841	PAPER NUMBER

DATE MAILED: 10/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/684,519

Applicant(s)

LEE, YIN-YUAN

Examiner

Hung S Bui

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 7-38, 43-45, 47, 50-53, 57-63, 65, 67 and 68 is/are pending in the application.

4a) Of the above claim(s) ____ is/are withdrawn from consideration.

- 5) ☐ Claim(s) ____ is/are allowed.

- 6) ☒ Claim(s) 1-4, 7, 8, 18-25, 28-38, 52, 53 and 57-59 is/are rejected.

- 7) ☒ Claim(s) 9-17, 26-27, 43-45, 47, 50-51, 60-63, 65, 67 and 68 is/are objected to.

- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____

DETAILED ACTION

1. The indicated allowability of claims 7-8, 25, 29-34, 46, 48-49, and 59 are withdrawn in view of the newly discovered reference(s) to Akram et al. [US 6,091,252]. Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-4, 8, 18-25, 28-34, 35-38, 53, 57-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson et al. [US 5,969,461] in view of Lin et al. [US 5,450,283] and Akram et al. [US 6,091,252].

Regarding claims 35-38, Anderson et al. discloses a printed circuit board structure (figure 1) comprising:

- a circuit board substrate (16) on the surface of which at least one point of an electrical contact (18) has been provided;
- one or more layers of underfill material (28) applied to the surface of the printed circuit board;
- a device (10) having a plurality of solder balls (20) mounted thereon; and

- wherein electrical contact is made between the point of electrical contact on the surface of the printed circuit board and at least one of the solder balls.

Anderson et al. disclose the instant claimed invention except for the specific material used for the underfill material and the device being a semiconductor device and depositing a layer of conductive material over the created layer of thermal relieve material and patterning the layer of conductive material.

Lin et al. disclose a semiconductor flip chip (18) mounted on a printed circuit board (12) via a plurality of solder balls (64) with an underfill layer (28) formed of a thermal stress reducing compliant material.

It would have been obvious to a person having ordinary skill in the art at the time invention was made to use the thermal stress reducing compliant material of Lin et al. for the underfill material of Anderson et al., for the purpose of reducing stress between the chip and the circuit board.

Akram et al. disclose using an electroplate process for depositing a layer of conductive material (28) over a created thermal stress relieve material (34) including an opening and patterning the conductive layer to form traces to interconnect contact pads (22, column 6, lines 6-51).

It would have been obvious to a person having ordinary skill in the art at the time invention was made to use the deposition process and patterning technique of Akram et al. in Anderson et al. in view of Lin et al., for the purpose of interconnecting components mounted on the substrate.

Regarding claim 53, Anderson et al. disclose curing the thermal stress relieve material (see abstract).

Regarding claims 57-59, Anderson et al. disclose the instant claimed invention except for the multiple layer printed circuit board structure and resin filler overlying points of electrical contact.

Lin et al. disclose a multiple layer printed circuit board structure and resin filler overlying points of electrical contact (14) mounted on an upper surface of the printed circuit board with interconnecting vias (figure 9).

It would have been obvious to a person having ordinary skill in the art at the time invention was made to use the multi layer circuit board/contact design of Lin et al. for the printed circuit board of Anderson et al., for the purpose of providing multiple signal paths and facilitating mounting of the semiconductor chip.

Regarding claims 1-4, 8, 18-25 and 28-34, as acknowledged by applicant (see response to restriction), the claimed method steps would have been inherent in the product structure.

4. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson et al. in view of Lin et al. and Akram et al. as applied to claim 1 above, and further in view of Numata et al. [US 4,792,476].

Regarding claim 7, Anderson et al. in view of Lin et al. and Akram et al. disclose the instant claimed invention except for the use of a photolithography process to create one or more openings in the created thermal stress relieve material layer.

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Numata et al. disclose the use of a photolithography process to create one or more openings in a created thermal stress relieve material layer (column 1, lines 15-54).

It would have been obvious to a person having ordinary skill in the art at the time invention was made to use a photolithography process to create one or more openings in the created thermal stress relieve material layer of Anderson et al., as modified, as suggested by Numata et al., for the purpose of forming the openings on the thermal stress relieve layer.

5. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson et al. in view of Lin et al. and Akram et al. as applied to claim 1 above, and further in view of Downes, Jr. et al. [US 6,373,717].

Anderson et al. in view of Lin et al. and Akram et al. disclose the instant claimed invention except for the surface of the thermal stress relieve material being roughened prior to application of the conductive deposition.

Downes, Jr. et al. disclose that it is known to roughen a stress relieve surface prior to the application of an conductive deposition.

It would have been obvious to a person having ordinary skill in the art at the time invention was made to roughen the surface of the thermal stress relieve layer of Anderson et al. in view of Lin et al. and Akram et al., as suggested by Downes, Jr. et al., for the purpose of improving adhesion of the deposition.

Allowable Subject Matter

6. Claims 9-17, 26-27, 43-45, 47, 50-51 and 60-68 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

7. Applicant's arguments with respect to claims 1-4, 7-38, 43-45, 47, 50-53, 57-63, 65 and 67-68 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung S Bui whose telephone number is (703) 305-8024. The examiner can normally be reached on Monday-Friday 8:30AM-6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David S. Martin can be reached on (703) 308-3121. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0956.

HB
9/13/03

A handwritten signature in black ink, appearing to read 'DLM', is positioned above the printed name and title.

DAVID MARTIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800